



Environmental analysis and landscape mapping INTRODUCTION

Mattia Previtali

Politecnico di Milano, DABC, mattia.previtali@polimi.it

Fabio Manfredini

Politecnico di Milano, DASTU, fabio.manfredini@polimi.it



INTRODUCTION

The course:

- First year this course is offered for the Master degree in «Landscape Architecture. Land Landscape Heritage»
- Innovative Didactics

The course:

- First year this course is offered for the Master degree in «Landscape Architecture. Land Landscape Heritage»
- Innovative Didactics

⇒ Feedbacks / Suggestions / Advices are welcome

⇒ Apologize us if something will not work properly.....

Innovative didactics:

- teaching of soft skill, or an across-the board kind of teaching
- a way of teaching that would promote a new behaviour for both teachers and students (flipped and blended classroom)
- planning and giving lectures in cooperation with companies, research institutions and authorities
- manifesto that could introduce the students to the MOOC contents realized at our University

Aim:

- Promote “**active learning**”
- “**Project based**” **didactic**, based on the study of a real problem
- Give more responsibility to students, ease **cooperation between classmates** **and** the relation with the **teacher**

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Co-protection with the outside world:

- planning and giving lectures in cooperation with companies, research institutions and authorities
- provide cross-fertilization between the world of research and the world of didactic and teaching
- close contact with state-of-the-art in research
- stimulate students in going deeper with class topics

Co-protection with the our classes:

1. MAUD-Lab – Mapping and Urban Data Lab (Politecnico di Milano –Department of Architecture and Urban Studies

- Fabio Manfredini



POLITECNICO
MILANO 1863

DIPARTIMENTO DI ARCHITETTURA
E STUDI URBANI

2. Italian National Research Council | CNR · Institute for Electromagnetic Sensing of the Environment IREA

- Paolo Tagliolato



istituto per il rilevamento
elettromagnetico dell'ambiente

3. Italian National Research Council | CNR · Institute of Atmospheric Pollution Research IIA

- Paolo Mazzetti



Invited speakers on the following topics:

1. Introduction to the course platform (Paolo Tagliolato – CNR)
2. Landscape synthetic indicators
3. Extract information from Geo-data (Paolo Mazzetti - CNR)
4. Landscape Mapping: how to visualize information in the proper way



Co-protection with the our classes:

MAUD-Lab – Mapping and Urban Data Lab (Politecnico di Milano -DASTU)

Mapping and Urban Data Lab is a technical hub within the Department of Architecture and Urban Studies.

Core team includes architects, urban planners, environmental scientist, experts in spatial analysis and in database design and management.

The laboratory provides support to faculty and staff in the following topics: Geographical Information System, database design and management, digital mapping, spatial analysis, urban analysis and planning, statistical analysis, data visualization, geospatial training, urban surveys.



Fabio Manfredini,

Mapping and Urban Data Lab manager

He holds a Master of Science in Environmental Sciences. He has been teaching assistant in Urban analysis and Geographical Information System (GIS). His main areas of expertise are methods and techniques of territorial and environmental analysis, design and management of geographical information systems, statistical and spatial analysis, mapping.

e-mail: fabio.manfredini@polimi.it



Co-protection with the our classes:

Italian National Research Council | CNR · Institute of Marine Science ISMAR

- Paolo Tagliolato – Milan
- SDI / Geoportals

In this course

- Provide the sharing platform



Co-protection with the our classes:

Italian National Research Council | CNR · Institute of Atmospheric Pollution Research
IIA

- Essi Lab Group – Firenze
- Cooperation with GEOSS – Development of the System of Systems infrastructure
- Interoperability between different source of data

In this course

- Hot to extract information from data.
- Big data



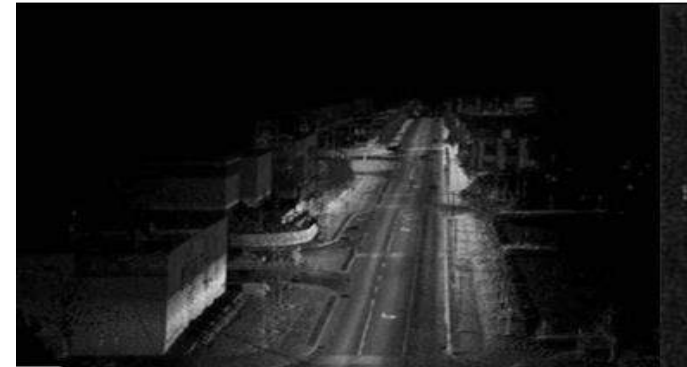
TOPICS

The course name:

- Environmental analysis and landscape mapping

Aim:

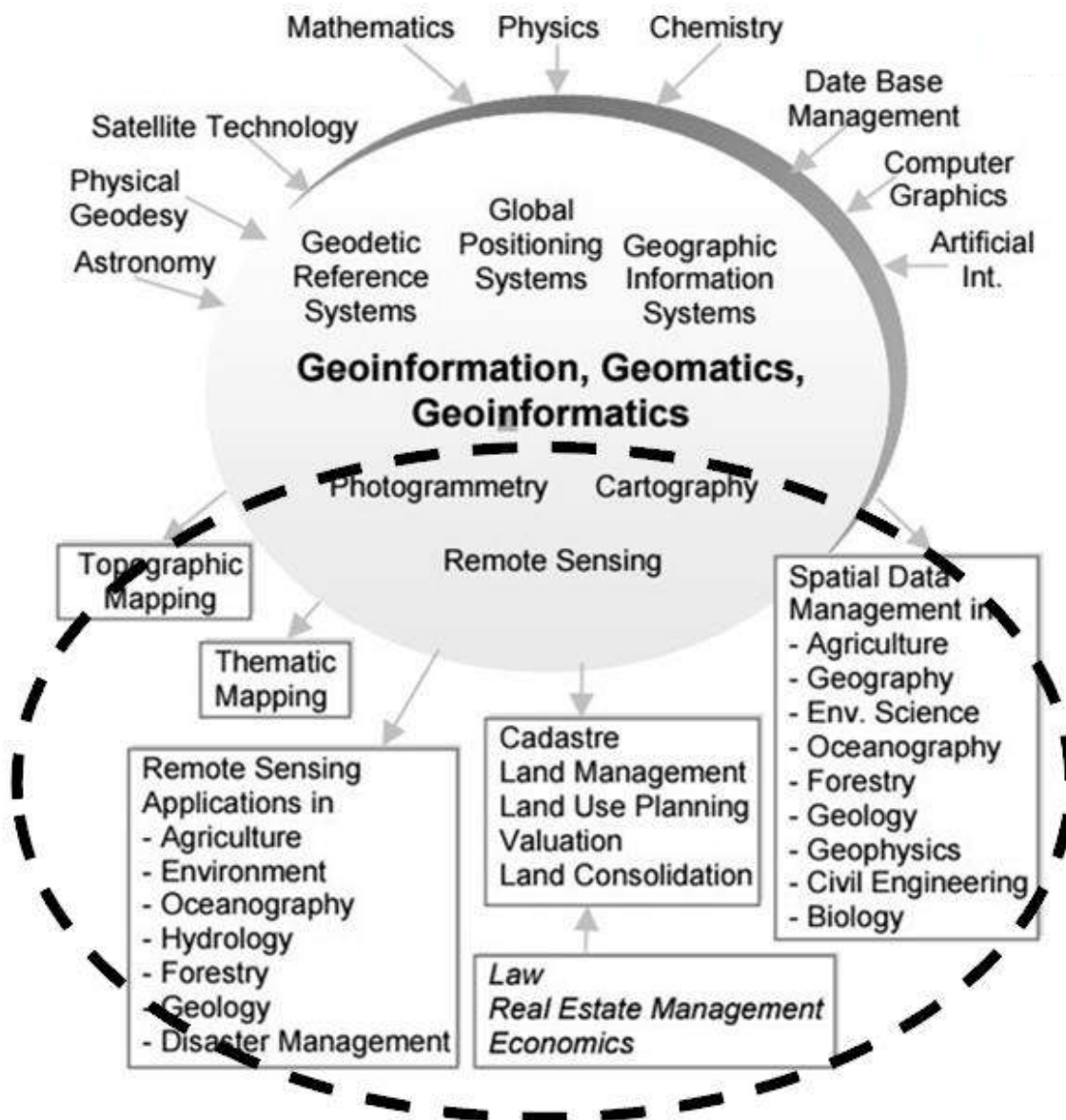
- Provide the basics about tools, methods and approaches in the field of cartography and Geomatic applications for environmental analysis
- Develop skills in the management and manipulation of geographical data in the framework of a geo-spatial data structure and system (GIS) for landscape mapping



Topics

- Geomatics
- Introduction to photogrammetry
- Principles of cartography
- Notions of Geodesy and System of reference
- Orthophoto and DTM (Digital Terrain Model)
- GPS (Global Positioning System)
- Data banks (Database) cartographic,
- Geographic Information Systems e Geoportals WebGIS
- Open data and the INSPIRE directive Updates,
- Applications and software (e.g. QGIS)

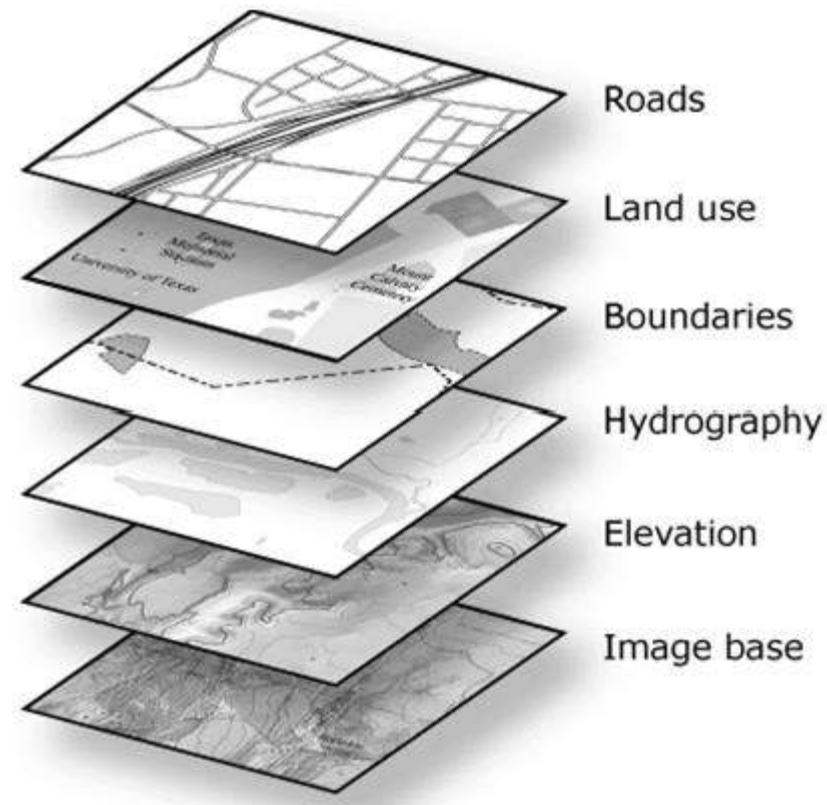
Why GeoInformation is important and relevant for us?



Geospace information at the service of other analysis

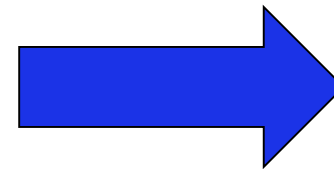
Geospatial information stands becoming more and more relevant to the public and professional users for two reasons:

- (1) Facilitate the design, visualization and analysis of the environmental factors that take place models on Earth's surface;
- (2) They can be refined and integrated with models and scenario simulations in order to predict current phenomena and / or future ones



Geospatial technologies

- + GPS/IMU
- + DSMs/DTMs
- + 3D/4D city models
- + Facility management
- + Mobile Mapping
- + Imagery: satellite, aerial, terrestrial (street views)
- + Maps, plans
- + Historic data
- + LBS, “smart” apps
- + Sensors in WEB 2.0
- + Sensors in smart buildings
- + GIS/SIS
- + Visualization/simulation/animation



NEED DATA
BASED ON
GEOSPATIAL
STRUCTURE

Data Acquisition

GPS



CROWDSOURCED DATA



UAVs



SATELLITE REMOTE SENSING



GEOCODING/
REVERSE GEOCODING



Google Maps Geocoding API



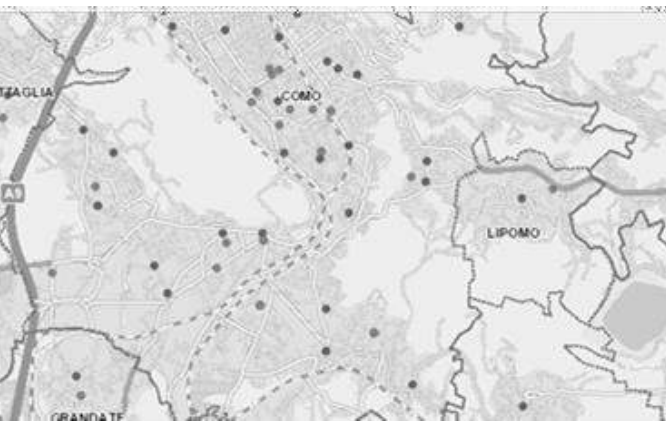
Aim?

SURVEY, MAPPING AND REPRESENTATION OF THE TERRITORY

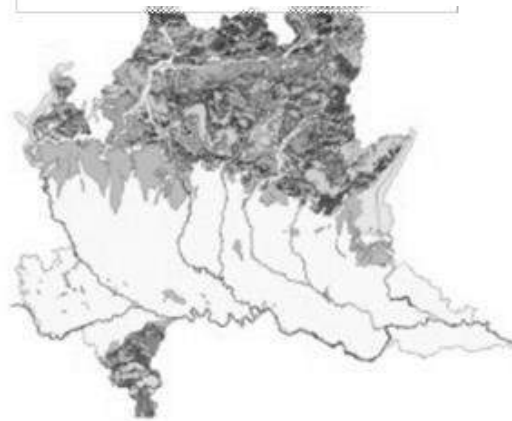


THEMATIC MAPS

SCHOOLS



GEOLOGICAL MAP

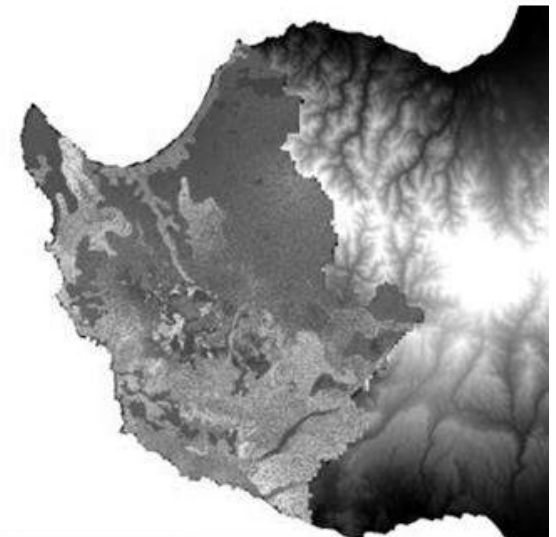
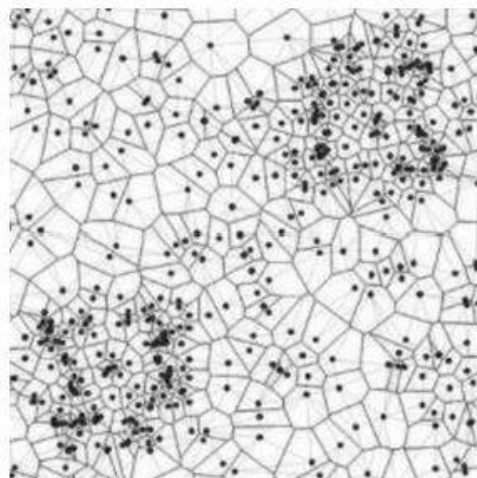
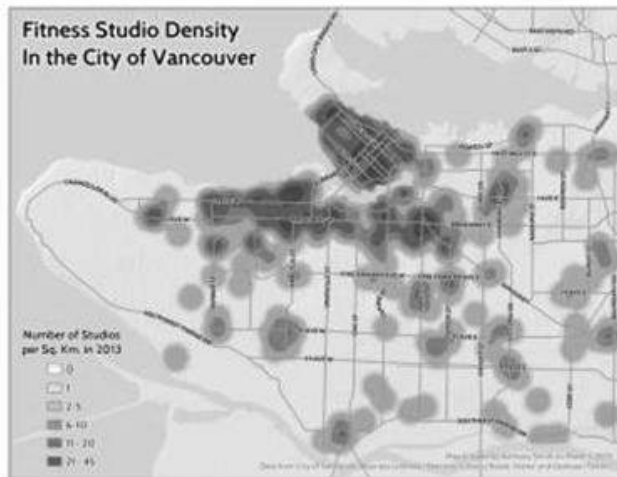
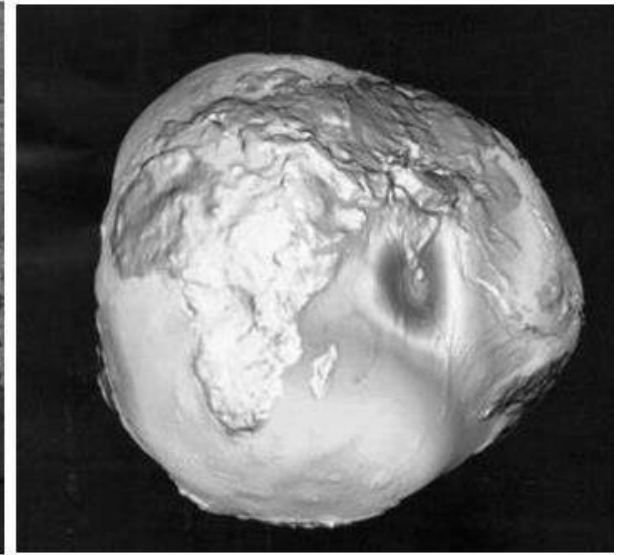
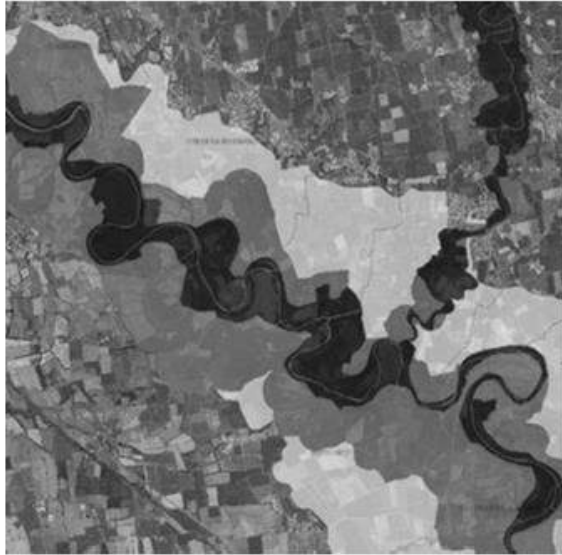


UNDERGROUND SERVICES



Aim?

MODELLING AND ANALYSIS



Aim?

MODELLING AND ANALYSIS

GENOVA 2011



SARDEGNA 2013



L'AQUILA 2009



MILANO 2014



SENIGALLIA 2011



AMATRICE 2016

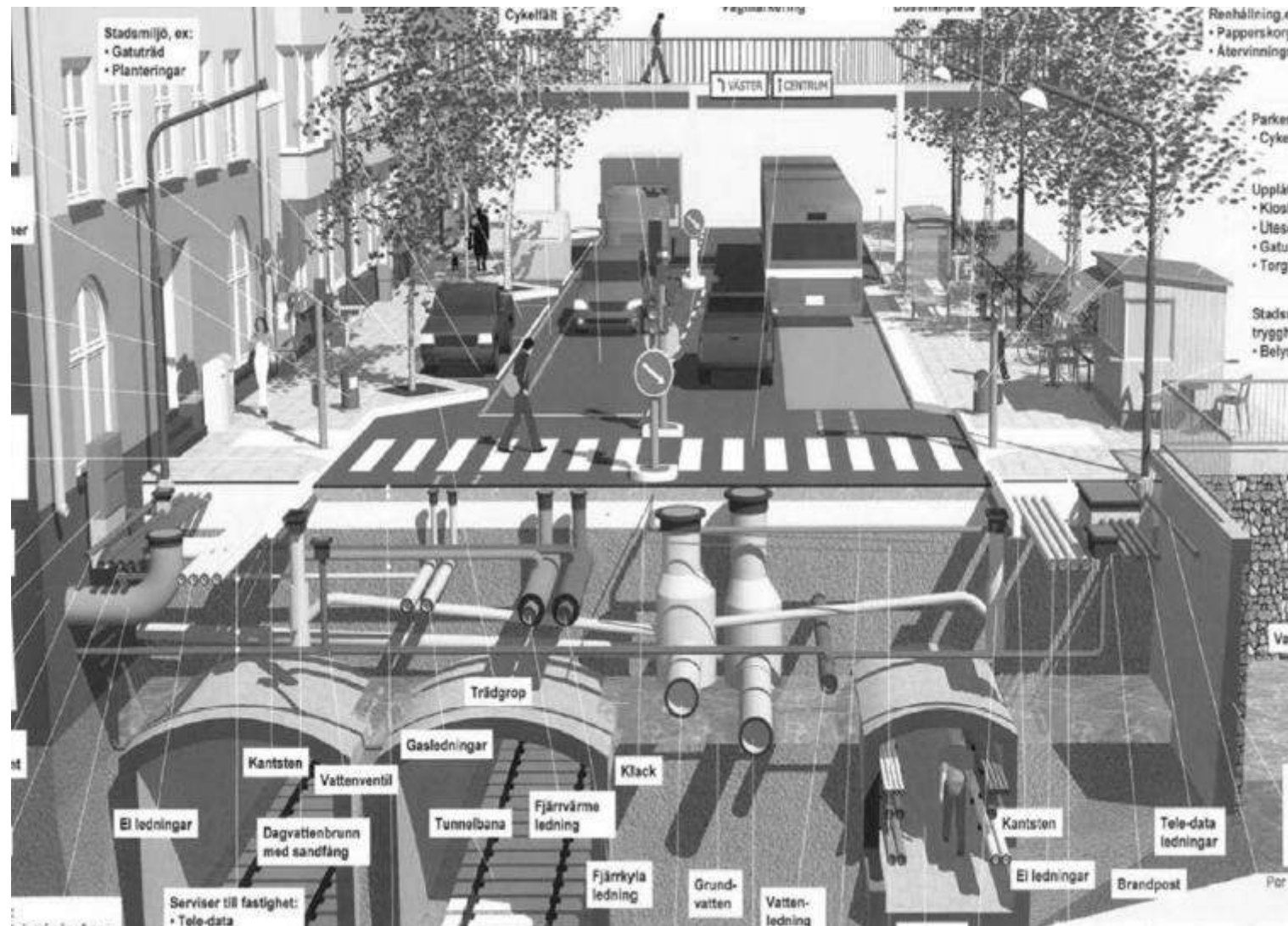
MODELING THE BUILDING ENVIRONMENT

Cities, and the built environment in general, are becoming more and more complex



MODELING THE BUILDING ENVIRONMENT

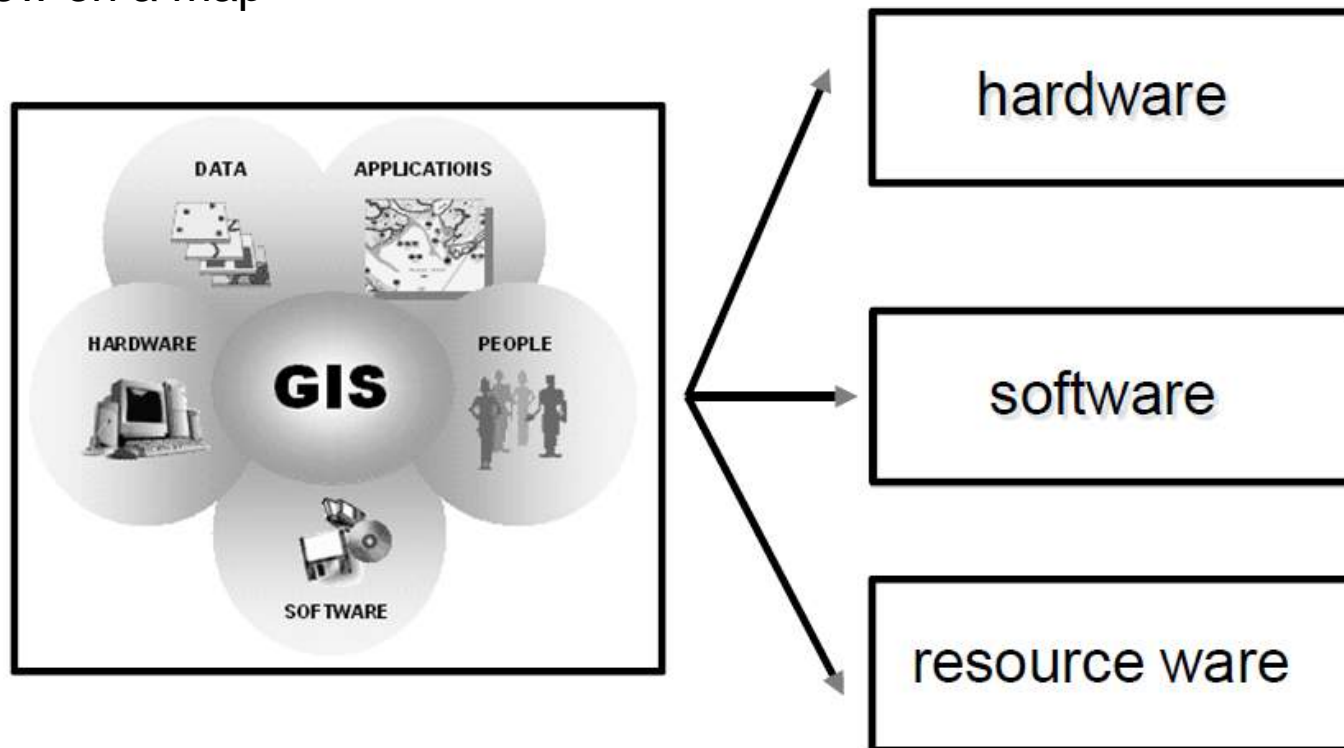
Cities, and the built environment in general, are becoming more and more complex



GIS IS NOT (only) A MAP

Geographic Information System (GIS) is an INSTRUMENT that:

- Collect geographical data
- Permit their conservation and manipulation
- Allows the analysis of spatial data
- Offers a view on a map

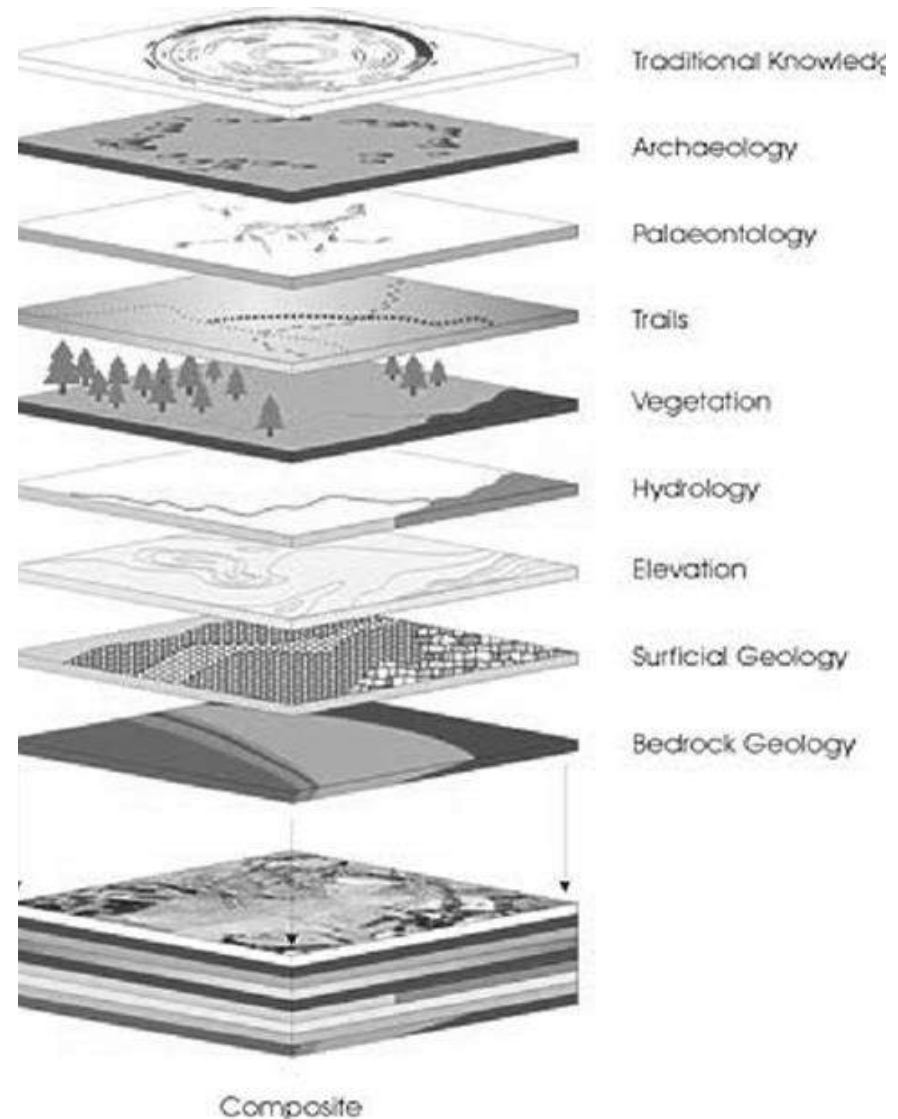


GIS IS NOT (only) A MAP

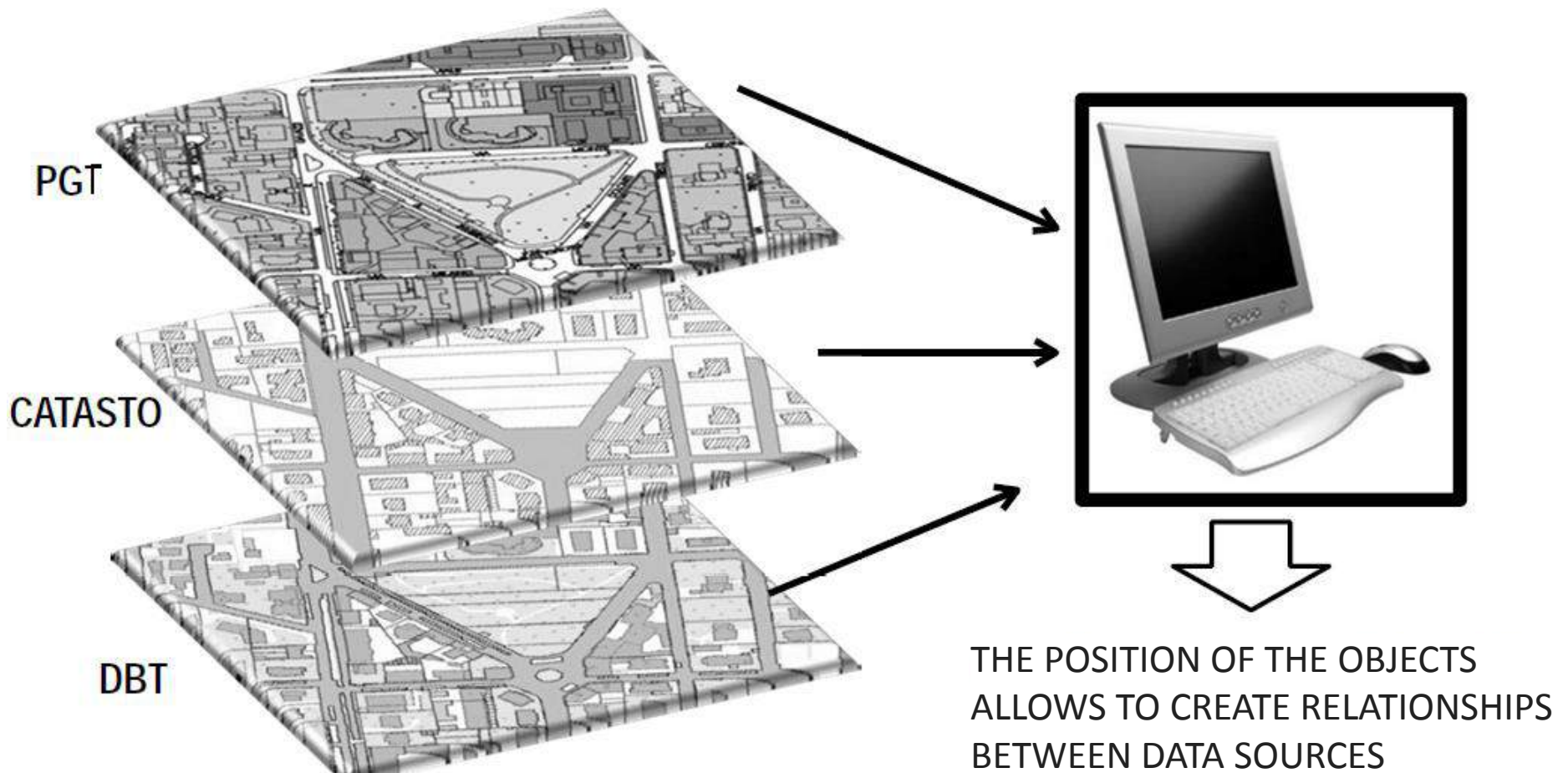
There are similarities between GIS and traditional cartography since they both have as a final product a map or a "Cartographic document".

The difference however lies in the fact that:

- 1) for a GIS there is no limit of the information that can be added
- 2) GIS uses statistical and spatial analysis to illustrate the data as informative support for various topics.



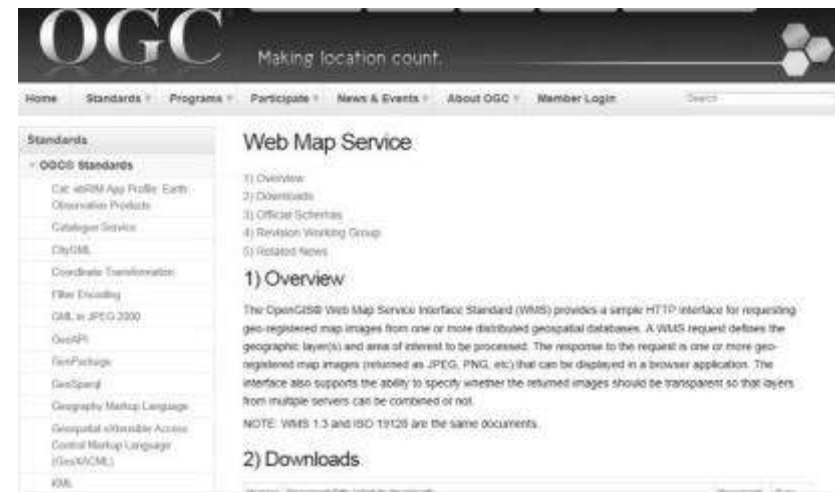
GIS IS NOT (only) A MAP



Data Sharing

“Communication“ means "send or exchange through a common system of symbols, signs or behaviors ", and "standardization“ means "to agree on a common system ".

Standards are facilitators of convergence between different technologies



A **Web Map Service (WMS)** is a standard protocol for serving geoinformation **over the Internet** that are generated by a map server using data from a GIS database

GEO SPATIAL DATA ON THE WEB

Geo-portals are a kind of "doors" of the World Wide Web (www) that organize contents and services such as directories, search tools, community information, support resources, data and different applications.

Thanks to their **descriptive and semantic nature**, geo-spatial information is able to provide a complete overview of a certain phenomenon, as well as to foresee possible implications of this event to the natural, social and economic context.





RESEARCH



MAUD-Lab – Mapping and Urban Data Lab (Politecnico di Milano - DASTU)

Structure

- Lab. Manager
- Staff (5)
- Scientific coordinator
- Scientific committee

Research topics

- Urban analysis and mapping
- Mobility and accessibility analysis
- Open data /big data for urban studies
- Data visualization



MAUD-Lab – Mapping and Urban Data Lab (Politecnico di Milano - DASTU)

PROJECTS:

- **La città degli orti**
 - Mapping urban gardens in the Milan metropolitan city (from above)
 - Surveys and questionnaires (from below)
 - Food production estimates
- **Postmetropoli**
 - Atlas of post-metropolitan territories in Italy
 - Mapping and analyzing the new urban phenomenon
 - Focus on data and visualizations
- **Mobility analysis and mapping**
 - Mobility indicators
 - Accessibility analysis
 - Mobile phone data and social media data for urban studies



GICARUS-Lab – (Politecnico di Milano - DABC)

Geographical Information and Content modelling: Architeturale heritage and built environment, eUrbanAtl@s, Remote Sensing Surveying and Monitoring

Structure

- Lab. Leader (Prof. Raffaella Brumana)
- Senior Researcher (2)
- Junior Researcher (2)
- PhD Students (1)

Research topics:

- Geo-Open Data analysis
- HBIM – BIM
- Advanced survey techniques
- Photogrammetry – laser scanning



GICARUS-Lab – (Politecnico di Milano - DABC)

PROJECTS:

- **Atl@nte dei Catasti della Lombardia**
 - Evolution of city landscape
 - Historical cadastral maps of Lombardi (18th – 20th century)
 - Relationship city / surroundings
- **Energic-od**
 - Evolution of riverbeds
 - Historical maps in 5 European countries
 - Flooding protection
- **Cura del Paesaggio – Salute delle Persone**
 - Changes in relationship between economic organization of agriculture / agriculture landscape / farm organization
 - Ca Granda ownership farms (Morimondo area)



Atl@nte dei Catasti della Lombardia

- Milan is not traverse by a large river but it is surrounded by a set of rivers
- Navigli were a system of navigable and interconnected canals around Milan
- The system consisted of five canals: Naviglio Grande, Naviglio Pavese, Naviglio Martesana, Naviglio di Paderno, Naviglio di Bereguardo.
- The first three were connected through Milan via the Fossa Interna, also known as the Inner Ring.
- The urban section of the Naviglio Martesana was covered over at the beginning of the 1930s, together with the entire Inner Ring.





La conca di Viarenna, la prima realizzata al mondo, fotografata nel 1890



Il laghetto di Santo Stefano, accanto alla Ca' Granda



La Vettabbia in via Calatafimi, nel 1880

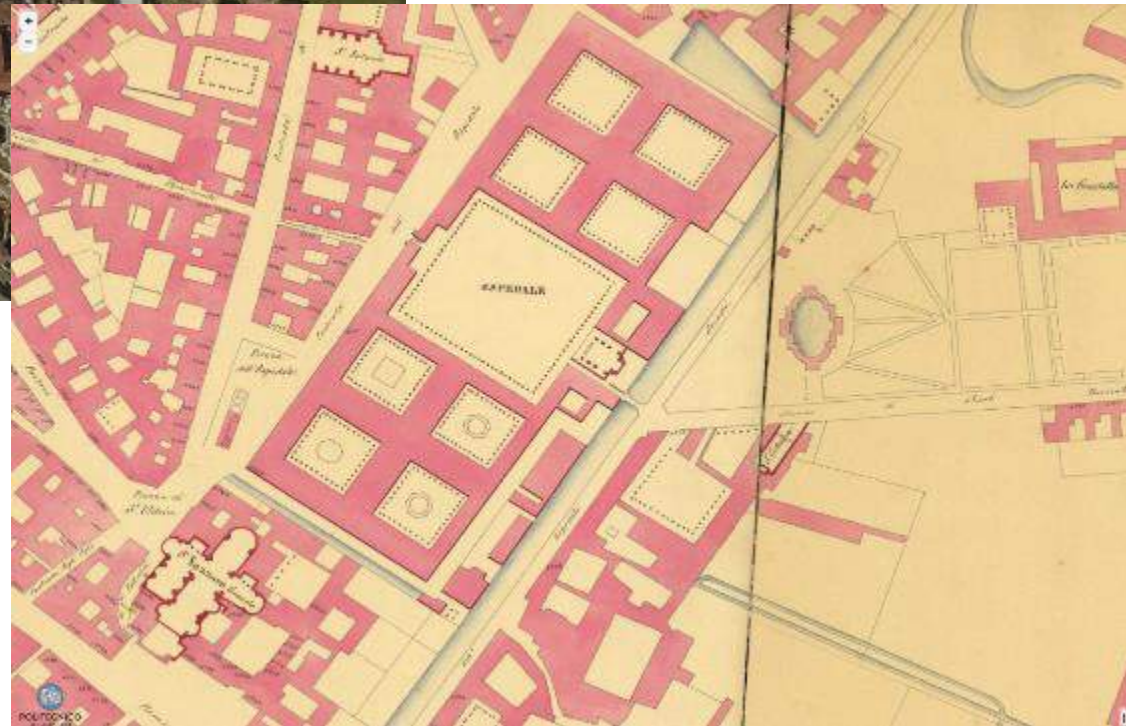


Il laghetto di san Marco in una foto del 1920

- The small Lake of St. Stephen and was close to the ancient hospital Ca' Granda (today Statale University).
- It was a small harbor for pieces of marble (used for the construction of the Cathedral) coming from the Candoglia mine
- More than 550,000 of marble were transported during the centuries
- The harbor was closed in 1857



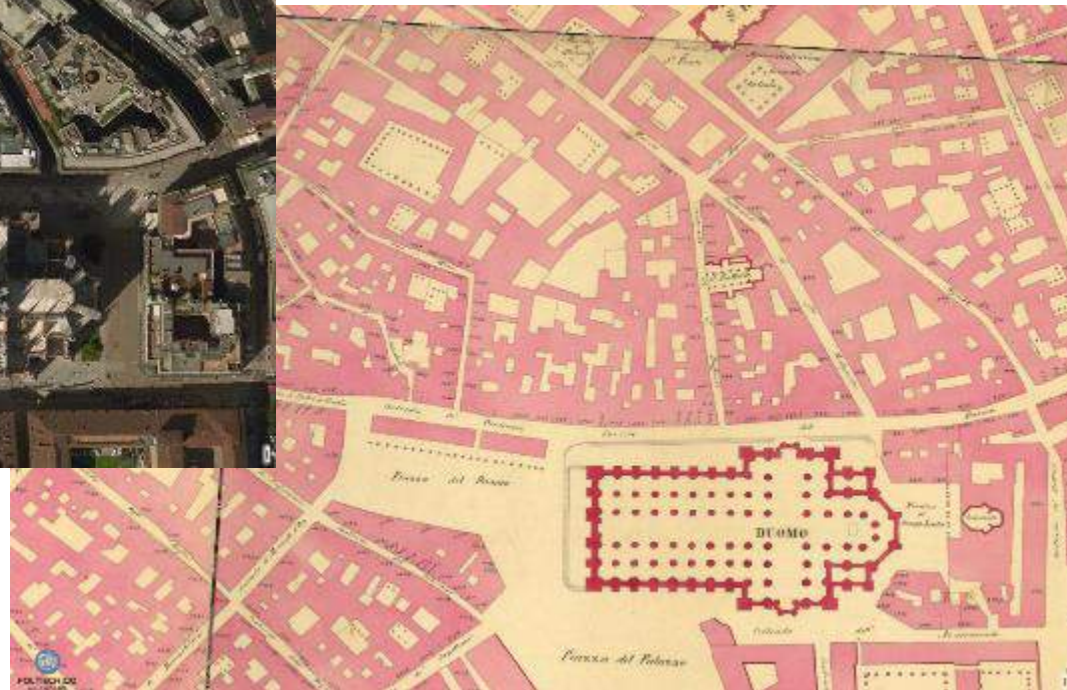
*Il laghetto di Santo Stefano,
accanto alla Ca' Granda*



The Naviglio Martesana in the area of Porta Nuova (Palazzo Lombardia)



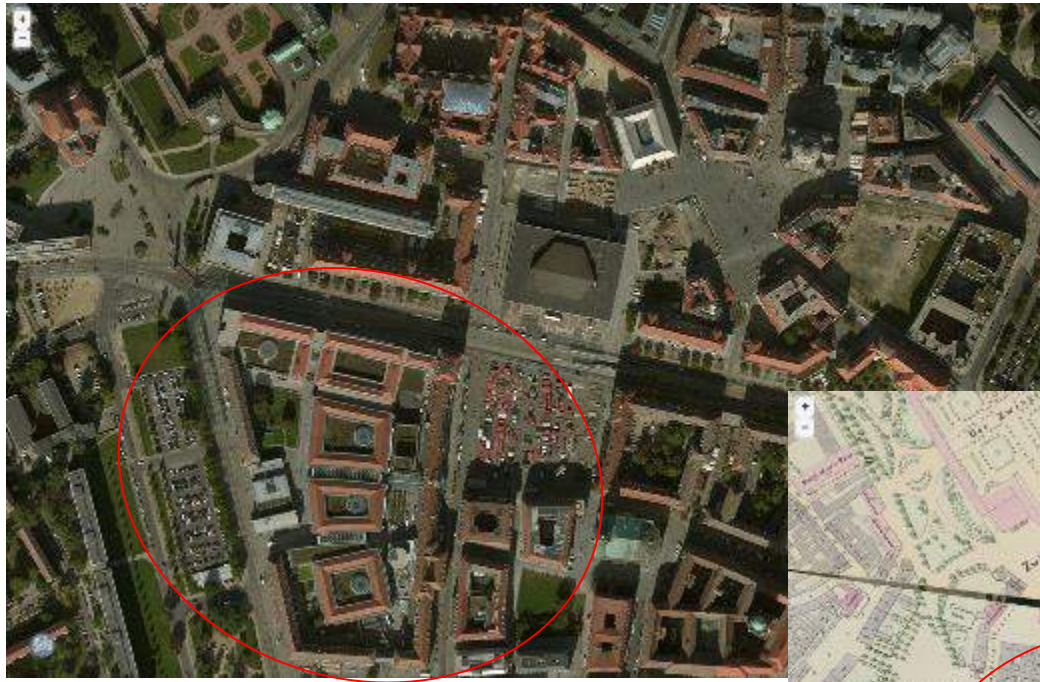
The idea of a new connection between the area of the Duomo and Piazza della Scala raised in 1939. In 1860 the municipality started a design competition. In 1863 Giuseppe Mengoni won the competition. In 1876 the gallery was inaugurated.



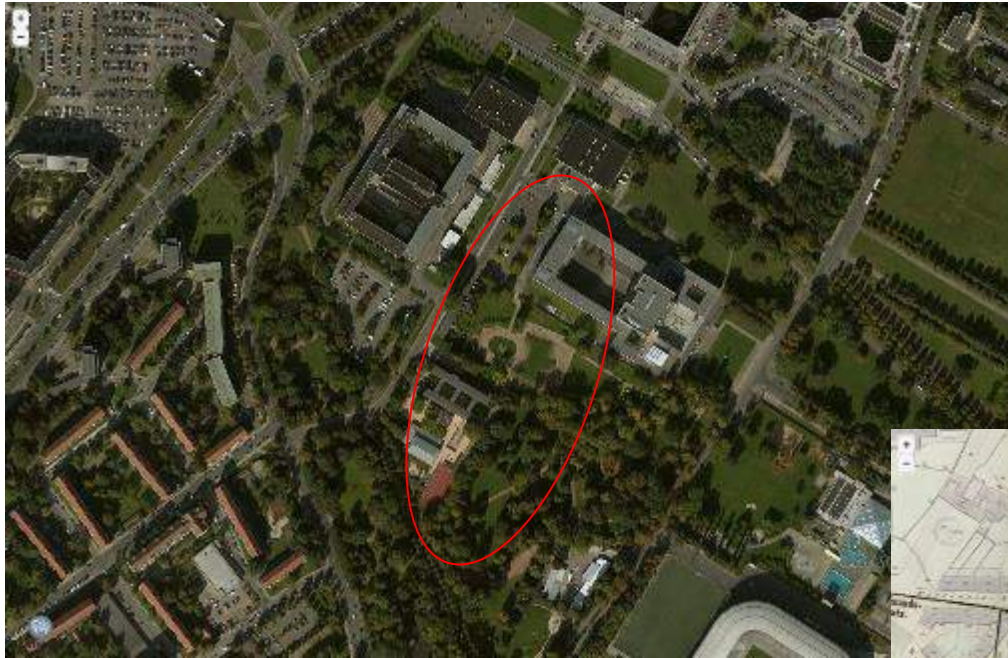
- Not only in Lombardy - Dresden
- The night of 13/14 February 1945 the city of Dresden was bombed by the Royal Air Force (RAF) and the United States Army Air Forces (USAAF) during WWII
- Over ninety percent of the city center was destroyed
- After the war Dresden was in the German Democratic Republic (DDR) and city leaders chose to rebuild large areas of the city in a "socialist modern" style
- Important historic buildings were reconstructed including the Semper Opera House and the Zwinger Palace
- Some of the ruins of churches, royal buildings and palaces, such as the Gothic Sophienkirche were razed by the Soviet and East German authorities in the 1950s.



The city center



Palais der Sekundogenitur (1770)





Energic-od

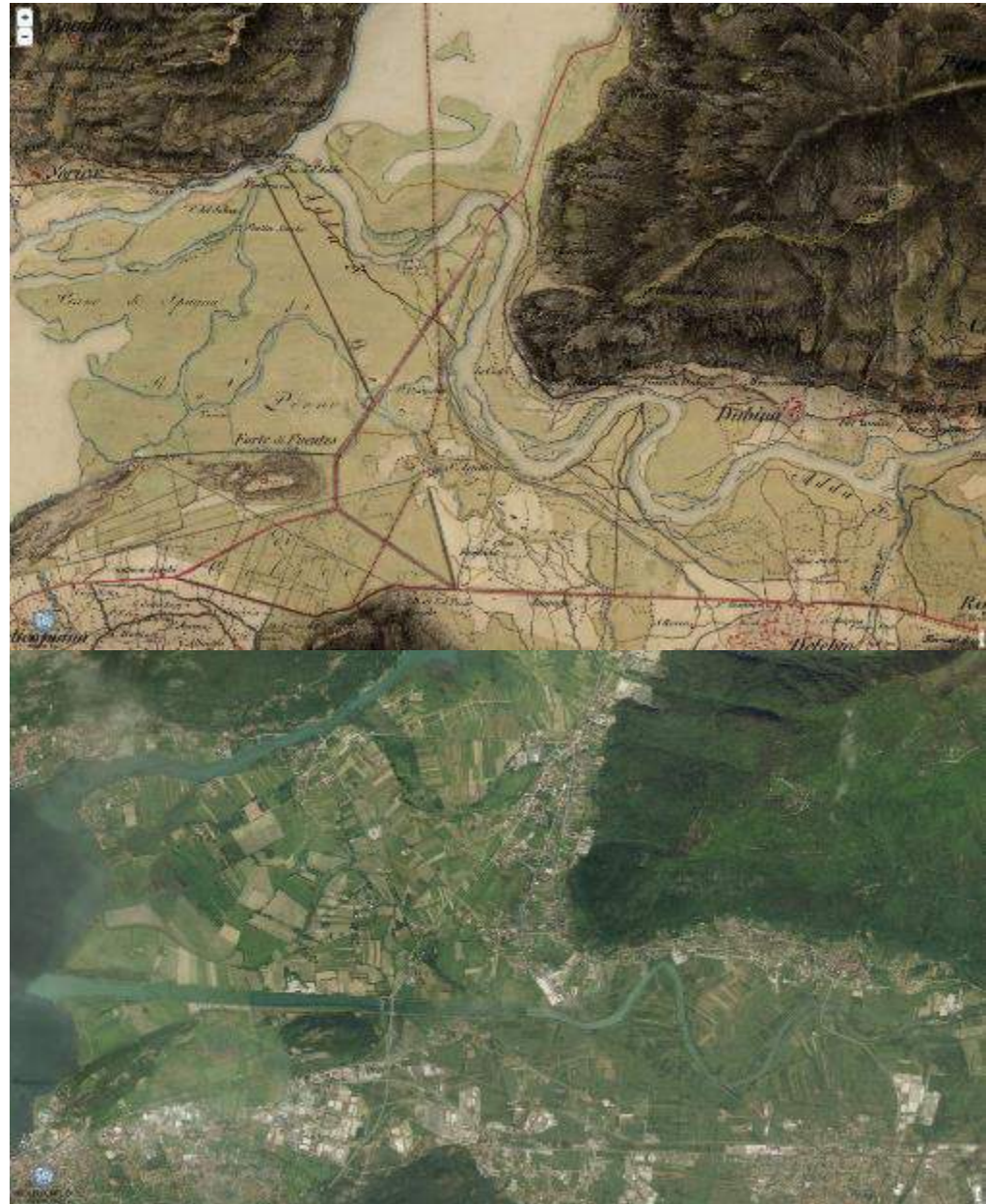


Energic-od

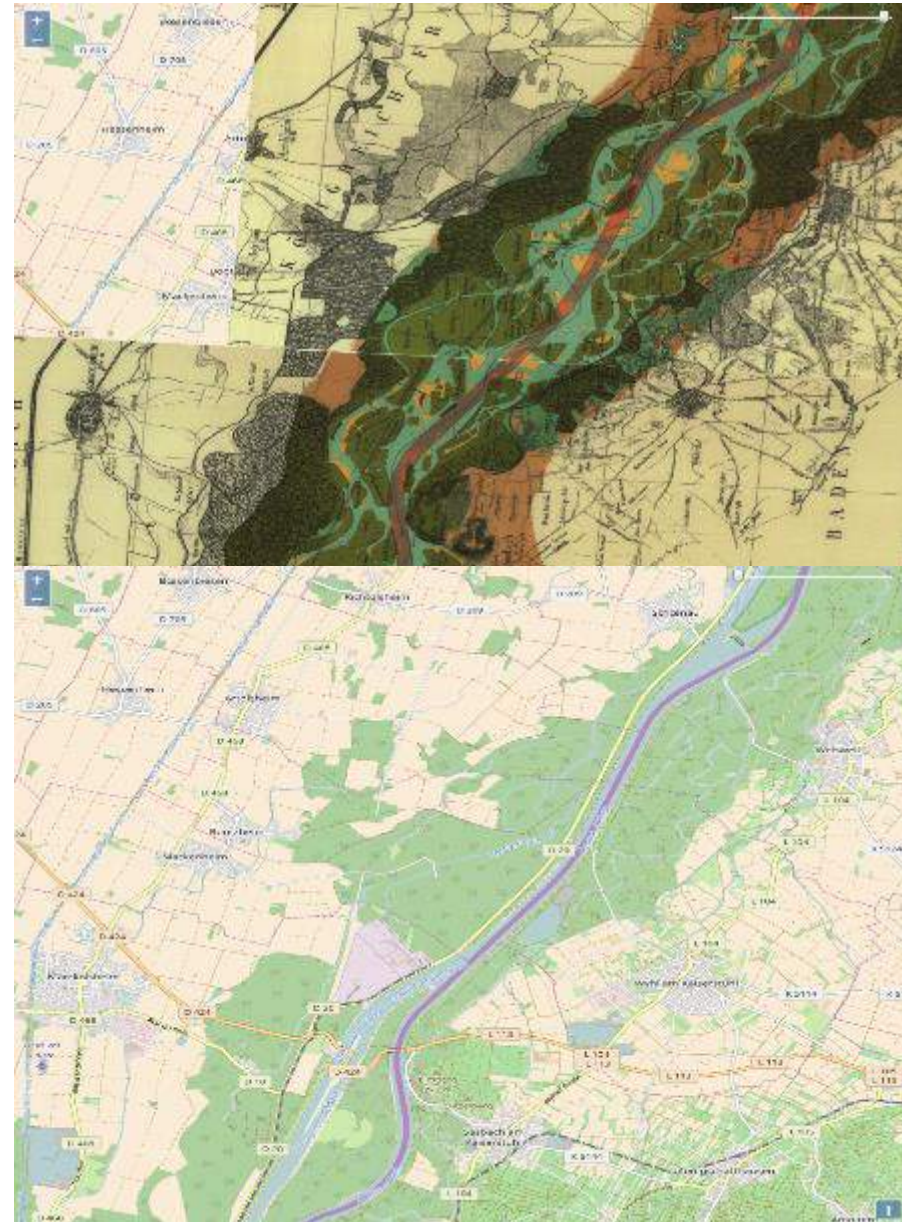
Why riverbeds?

- Higher hydrogeological risk
 - Higher seismic risk
 - Land use changes
 - Biodiversity
-
- **Hot to track changes**
 - Historical maps
 - Satellite images
 - On-Field survey

- Pian di Spagna was a swamp always flooded by the Adda River
- Austrian administration(beginning of the XIX cent.) faced the problem of the definitive and rational path to be given to the Adda
- Giuseppe Cusi (1829) has the task of "drafting a new rectilinear riverbed for the Adda and a canal for the emissary of Lake Mezzola that would allow navigation."
- Following these works (1858), the Adda abandoned forever its old course and moved from the emissary of Lake Mezzola to Lake Como.



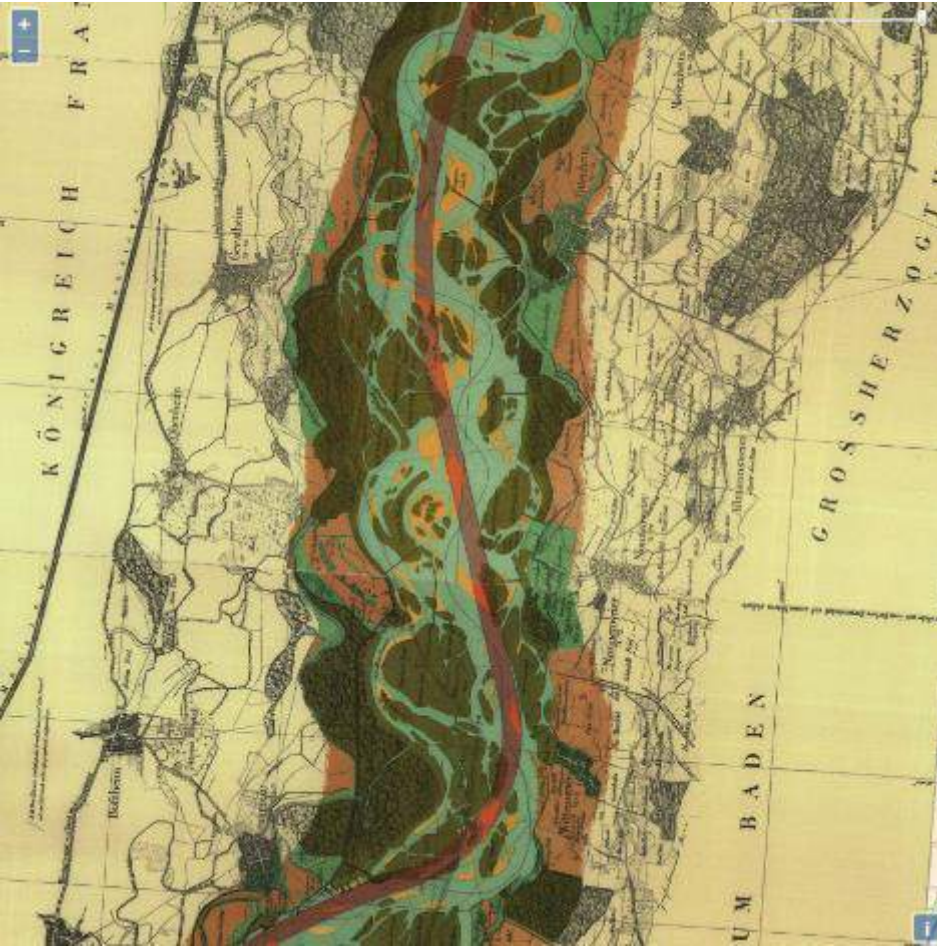
- Until the beginning of the XIX cent. the upper Rhine was a wild area and the river diverted into several meandering
- ❖
- In 1812 Johann Gottfried Tulla designed a complete reshape of the area converging all meandering into a single channel
- Baden and Bavaria signed an agreement. Works involved mainly the area around Mannheim and the confluence with Neckar
- The flooding of 1824 proved the importance of those works



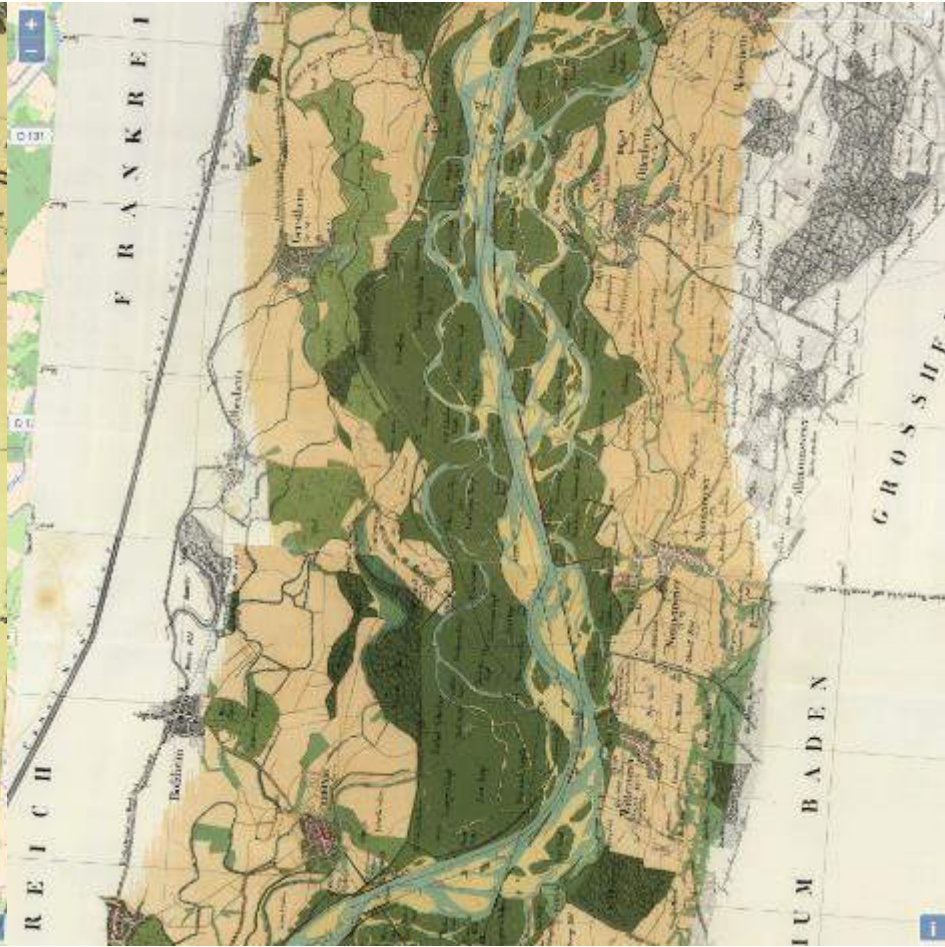
- In 1840 an agreement was signed between Baden and France to extend the rectification works in the area between Basel and Lauterbourg
- Works ended in 1895
- The length of the river was reduced of 14% between Basel and Lauterbourg and of 37 % between Lauterbourg and Mannheim
- ❖
- 40,000 hectares of swamp area "Ried" were transformed into cultivated areas agricultural area



1842



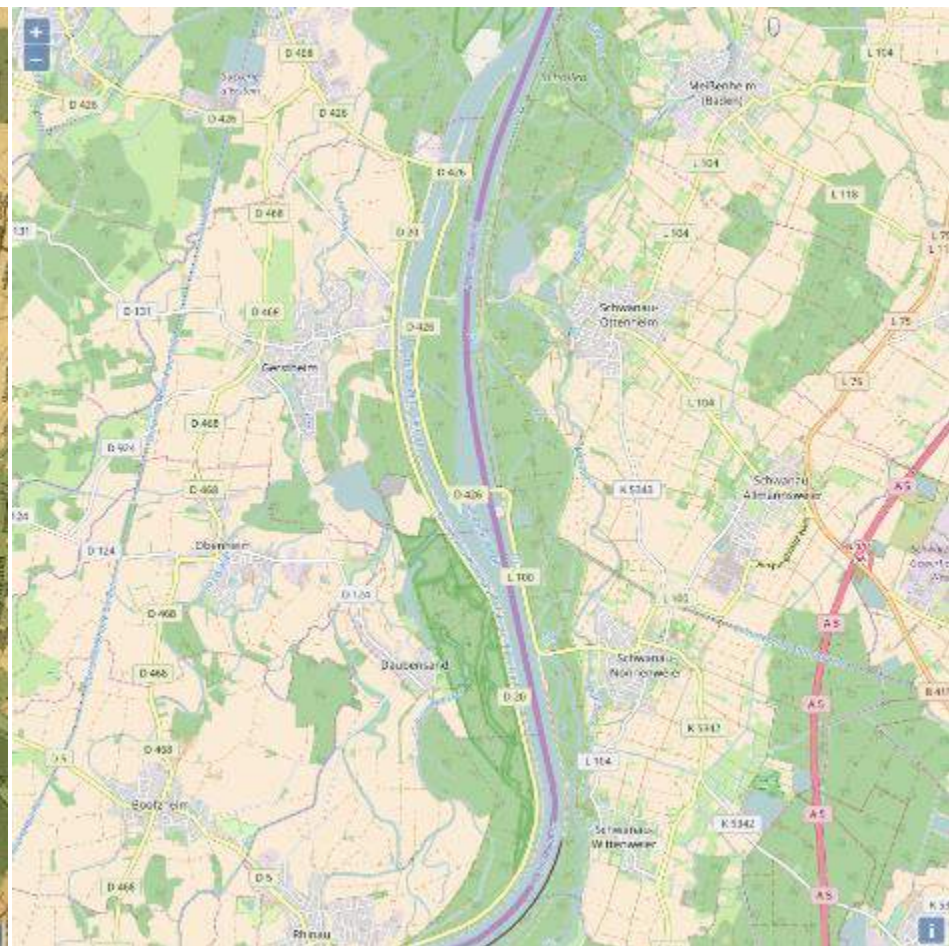
1862




1882



2017

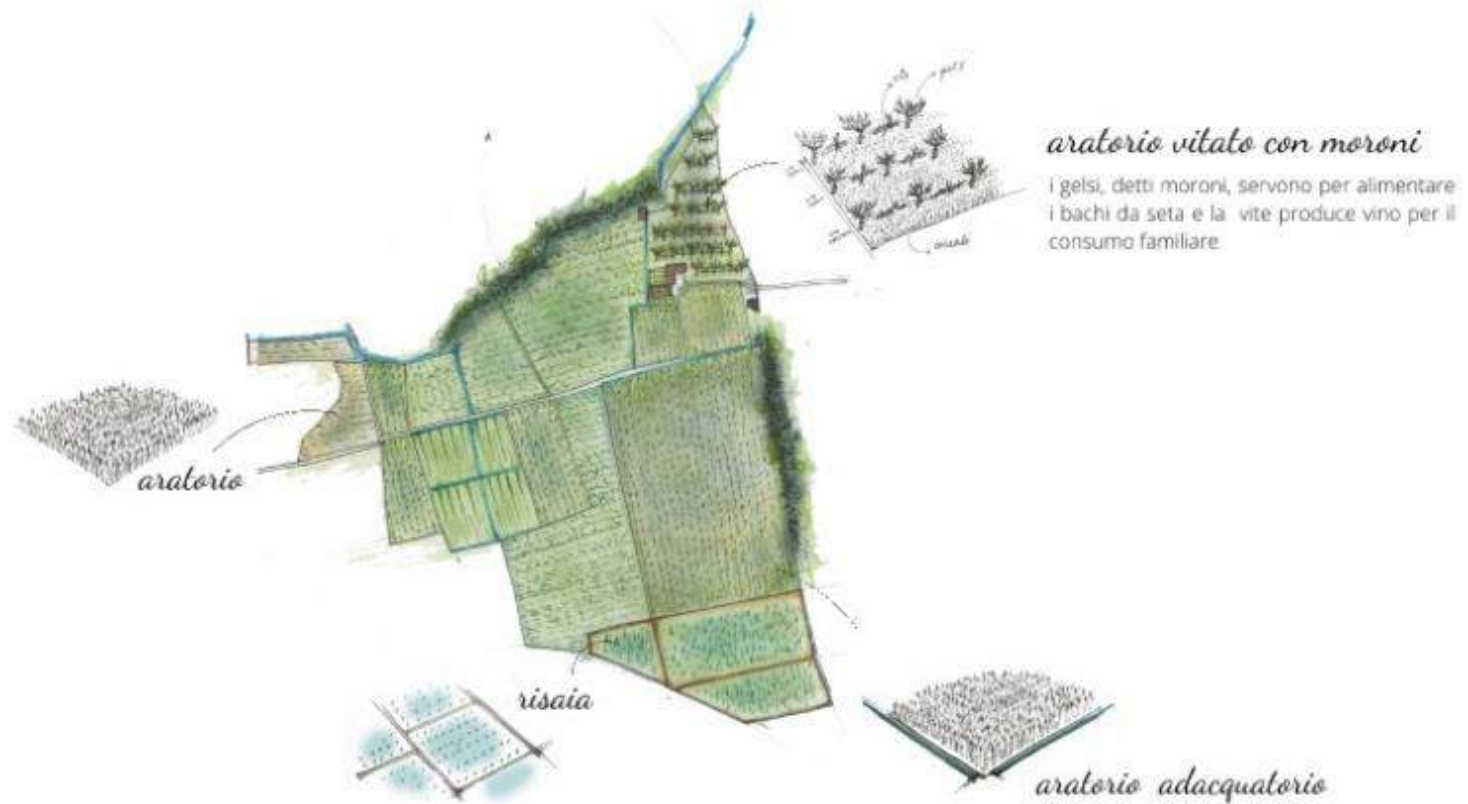




Cura del Paesaggio – Salute delle Persone

- Which is the relation between economical model / field cultivation / rural landscape

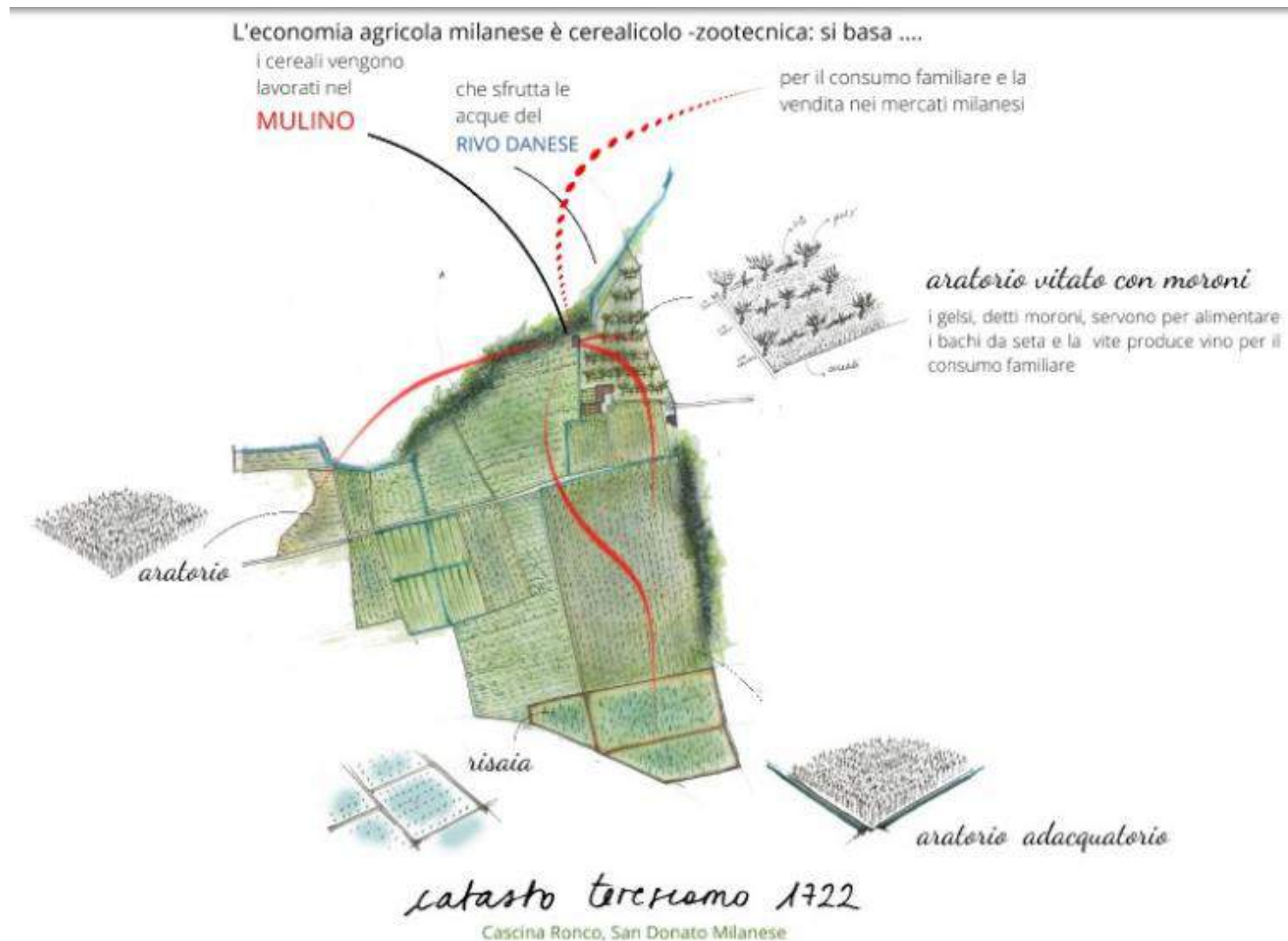
L'economia agricola milanese è cerealicola -zootecnica: si basa



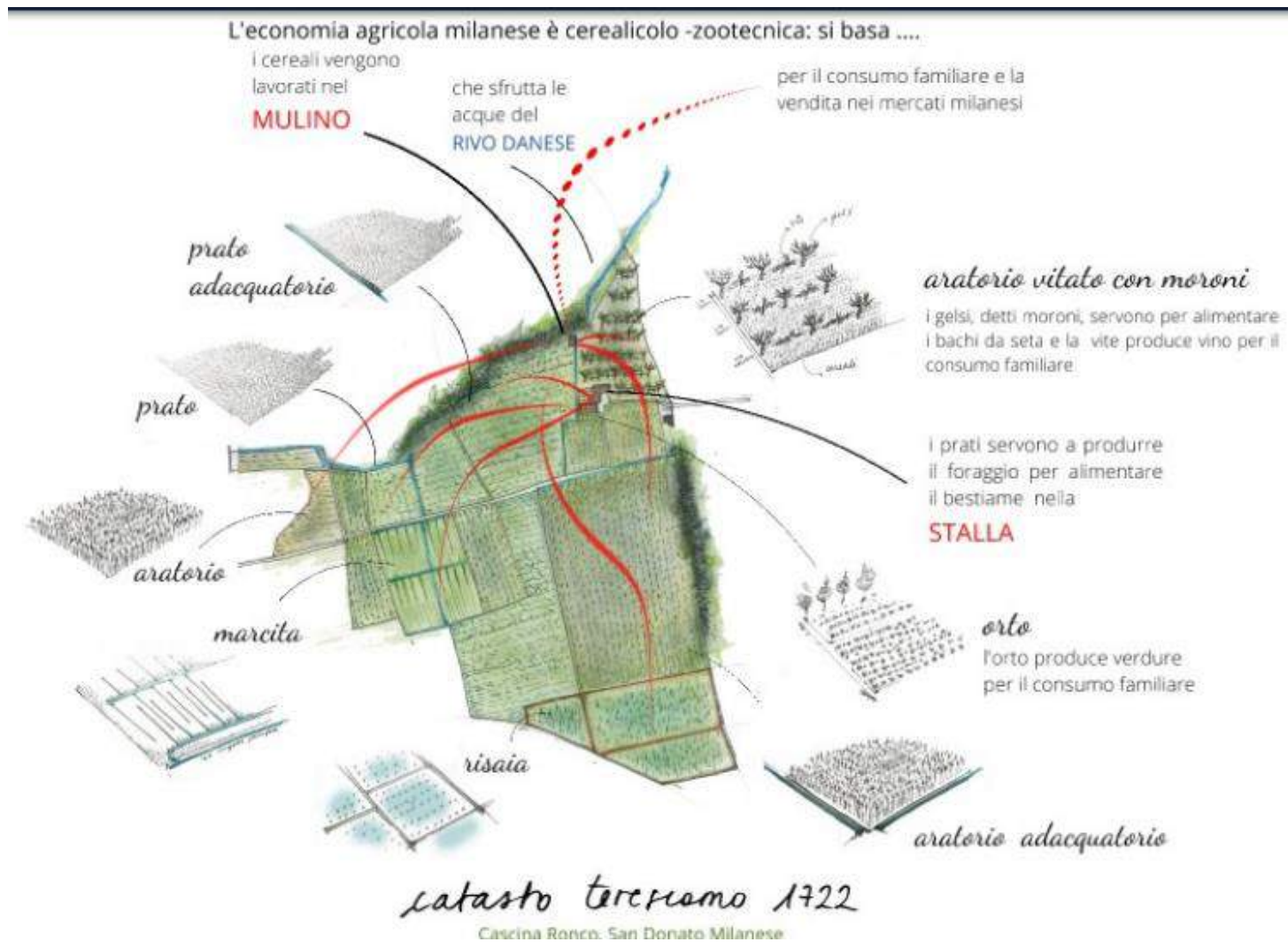
catasto teresiano 1722

Cascina Ronco, San Donato Milanese

- Which is the relation between economical model / field cultivation / rural landscape



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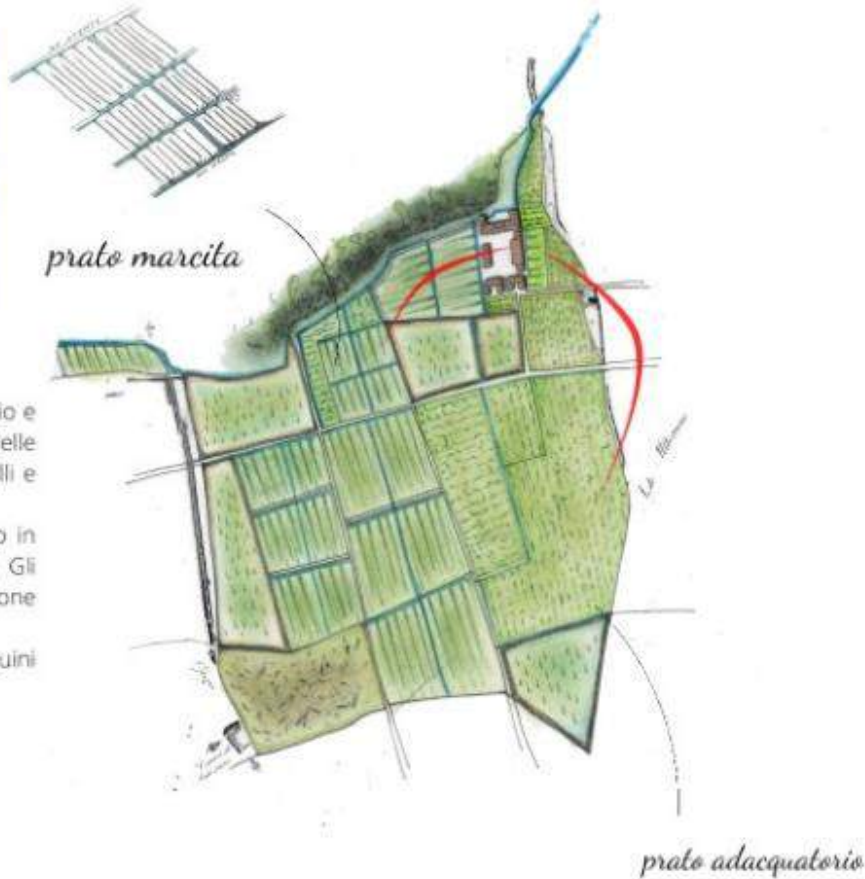


- Which is the relation between economical model / field cultivation / rural landscape

All'intensificarsi della produzione foraggera (evoluzione dai prati adacquatori in prati a marcita) corrisponde la nuova costruzione di fabbricati agricoli secondo una gerarchica organizzazione aziendale



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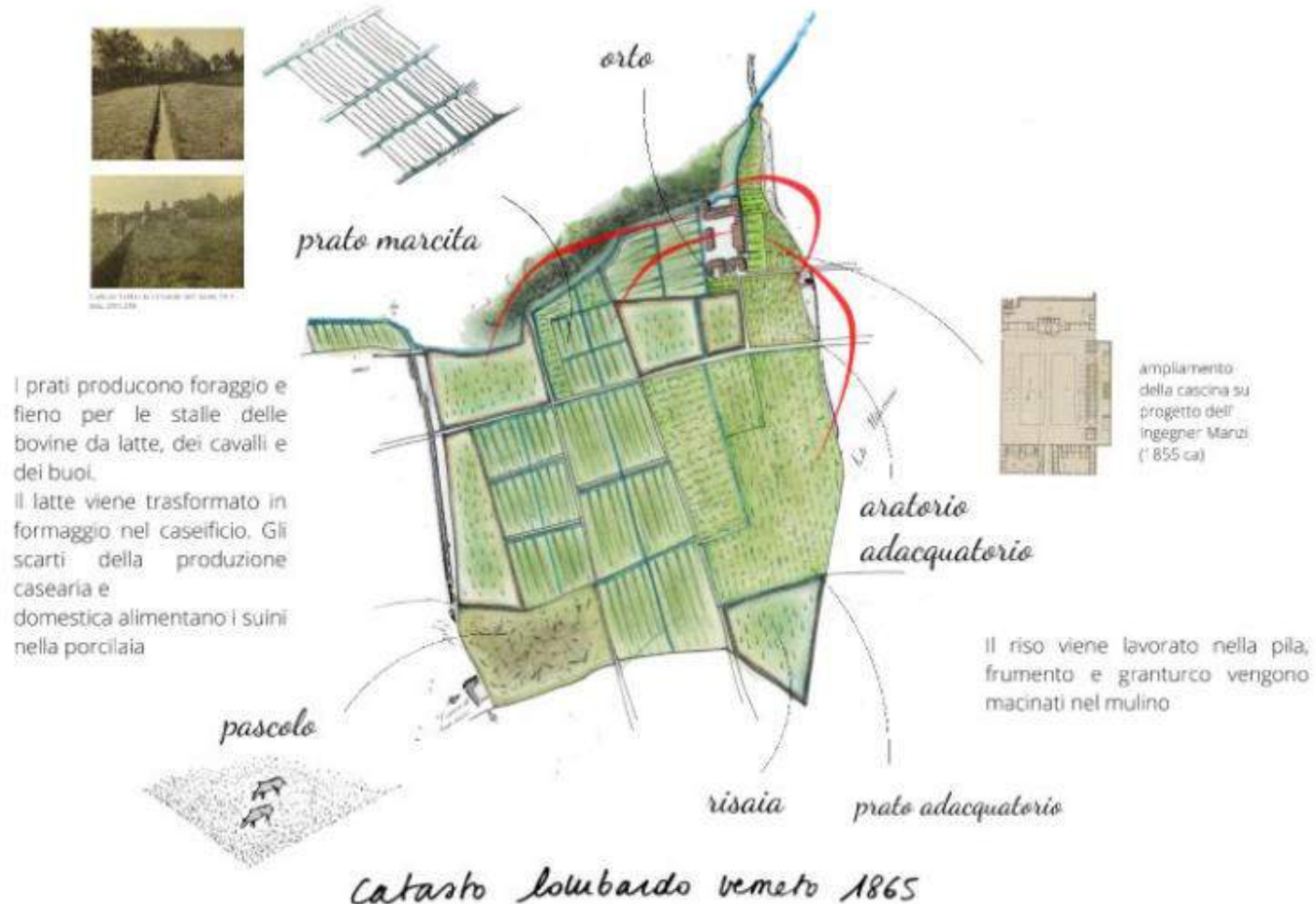


I prati producono foraggio e fieno per le stalle delle bovine da latte, dei cavalli e dei buoi.
Il latte viene trasformato in formaggio nel caseificio. Gli scarti della produzione casearia e domestica alimentano i suini nella porcilaia.

Catasto lombardo veneto 1865

- Which is the relation between economical model / field cultivation / rural landscape

All'intensificarsi della produzione foraggera (evoluzione dai prati adacquatori in prati a marcita) corrisponde la nuova costruzione di fabbricati agricoli secondo una gerarchica organizzazione aziendale



- Results in a web App

Ospedale Maggiore

www.campocascina.polimi.it/map/index.html

Cerca

+
-

Catasto teresiano, 1722

Mappa del podere Lasso, 1775-1776

TORNA AI PERCORSI

FONDAZIONE SVILUPPO CA' GRANDA

Cascina Lasso nel XVIII secolo

Dalle mappe e dalle descrizioni contenute nelle "consegne" redatte nel Settecento, la cascina Lasso è composta da fabbricati disposti su tre lati attorno all'aja. Oltre

3

Residenze
1777
Piano terra

4

Allevamento
1777



COURSE ORGANIZATION

Logistic information

- Classes on Monday Morning 8:15 – 11:15 | Classroom D.2.2
- Lectures and / or seminars Lessons + exercises
- Frequency not mandatory, but ... highly recommended
- We are planning some group activities. If someone will not follow classes and cannot participate to group activities please keep in touch with me!!
- To follow Tutored classes you need to install QGIS on your own laptop

Exam:

- Dates not yet available
- Examination mode: Presentation and discussion of team work + Individual oral exam about course classes
- Team work will be delivered some days before the exam (typically a week)

Tools / Infrastructures supporting our classes

- **Open Data Publication platform** to publish and exchange Geo-Data produced during this course (provided by CNR - ISMAR)
 - Products and elaboration performed by groups should be uploaded in the course platform
 - This platform will collect «scientific» and «technical» outputs
- **Web Site of the Course**
 - Aim of this is to prepare a set of material that can be used by students but also by someone else (professionals) and present in an “attractive” way the outcomes of the course
 - Students are highly welcome as “volunteers” to work on that “communication tool”

DRAFT AGENDA

DAY	TITLE	TOPICS
17-Sep	Introduction and background questionnaire	Introduction to the course, description of the course framework and background pool
24-Sep	Lesson: Introduction to Cartography 1	Introduction to historical maps with specific reference to metrical and non-metrical products. Principles of analytical cartography (maps, projections, datum). Introduction to measuring approaches (GPS, LIDAR, aerial photogrammetry)
1-Oct	Lesson: Introduction to Cartography 2	
8-Oct	Lesson: GIS Introduction	Introduction to Geographical Information Systems and example of applications
15-Oct	Tutored Class: GIS 1	
22-Oct	Tutored Class: GIS 2	
29-Oct	Seminar: Introduction to the course platform	Paolo Tagliolato
5-Nov	Field measurements : GPS	On site measurement with GPS and their porting into a GIS system
12-Nov	Tutored Class: GIS 3	

DRAFT AGENDA

DAY	TITLE	TOPICS
19-Nov	Review of students work	
26-Nov	Seminar: Landscape indicators	
3-Dec	Seminar: Extract information from data	Paolo Mazzetti
10-Dec	Seminar: Landscape Mapping	
17-Dec	Review of students work	

This agenda is just a draft

We would like to modify it according to your interests / suggestions / feedbacks

A more consolidated Agenda will be released after today class

Team Work

- Develop in depth one of the presented tutored classes (selected by the students)
- 3-5 students each group
- Retrieve existing data
- Organize data, produce new data and analysis
- Tools discussed during tutored classes
- Publish data and exchange then on the course platform
- Final delivery of materials (boards/reports/etc.) presenting the work performed (workflow) and the outputs



BACKGROUND POOL

- Aim of this pool is to retrieve some information about your background and interests
- The pool is anonymous
- Answer sincerely to the questions
- Take it seriously!!!!



<http://etc.ch/47Gw>